SURVEY OF WATER SUPPLIES & SEWAGE DISPOSAL GOGAMA TOWNSHIP OF NOBLE & JACK (UNORGANIZED)

Ontario

Ministry of the Environment

North-Eastern Region
R. E. Moore
Regional Director

SURVEY OF WATER SUPPLIES & SEWAGE DISPOSAL

GOGAMA

TOWNSHIP OF NOBLE & JACK (UNORGANIZED)

June 1975
Municipal & Private Abatement
Timmins District
Northeastern Region

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INTRODUCTION

A pollution survey of the unorganized community of Gogama was conducted during the week of June 9th, 1975. The survey was conducted by three members of the Municipal & Private Abatement staff of the Ministry of the Environment office in Timmins.

The purpose of the survey was to sample all water supplies in Gogama and to thereby ascertain the quality of the water being used by the residents. As ground water in Gogama has been known to contain high concentrations of nitrates, one of the primary objectives of the survey was to determine the location and extent of nitrate contamination. Secondary objectives included determining the extent of other contaminants in the water supply and the method of sewage disposal used by each residence. From the results of sample analyses and the information obtained, recommendations regarding the water supply were to be made.

The survey team conducted a door to door survey of every home and business in Gogama. In total, 112 bacteriological and routine chemical samples were taken. Samples were also taken wherever the survey team felt that the water might be contaminated by phenolic compounds. In total, fourteen phenol samples were collected.

SUMMARY

The two communal systems utilized in Gogama, the MNR and the CNR supplies, were bacteriological and chemically safe for drinking at the time of the survey. The CNR system supplies water which has an unpleasant taste and odour but is safe to drink. The MNR system appears to be working well without taste and odour problems.

The private water supplies in Gogama are, in general, contaminated by nitrate. Both sand points and drilled wells were found to be contaminated.

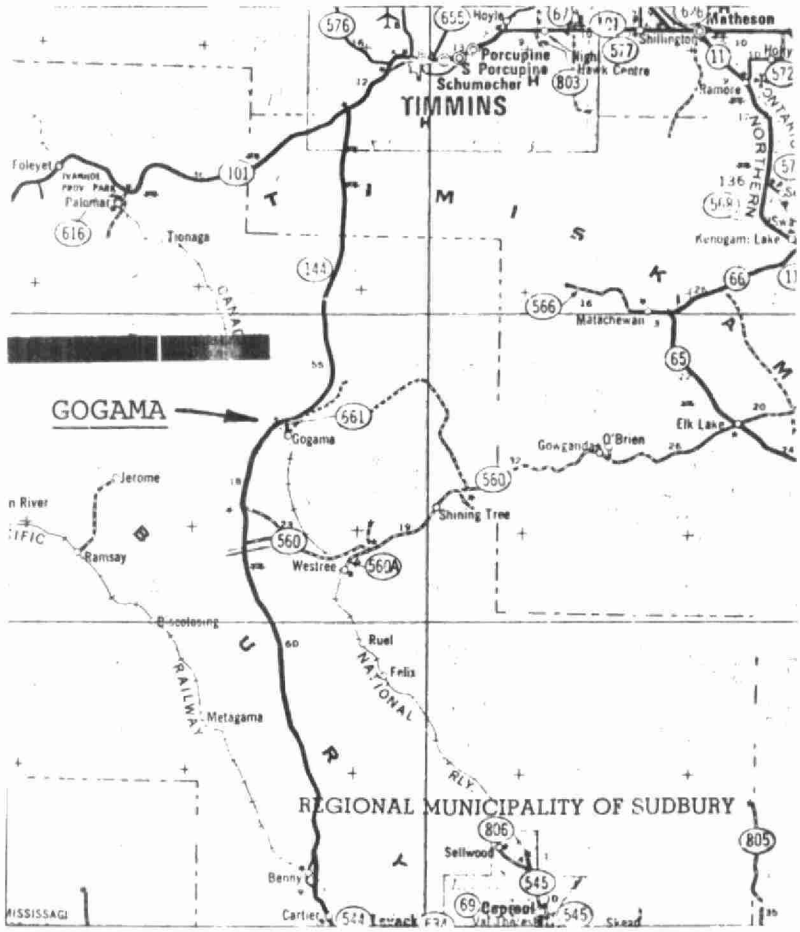
The investigation has shown that the nitrate contamination of the ground water table has widened in the last two years. From the map prepared at the time of the 1973 survey it is evident that the nitrate is spreading and increasing in concentration. It appears that the contaminated ground water is moving radially away from the centre of town toward the lake and in doing so is moving into areas which were previously free of contamination.

Areas which were contaminated by phenolic compounds in 1973 were found to be not contaminated in 1975 although two other supplies were. In total, 57 water supplies recorded excessive nitrate levels, 10 were bacteriologically contaminated, 2 showed phenolic contamination and 23 had excessive levels of sodium. High levels of chlorides and free ammonia were also noted in several systems.

GENERAL

1) Location

Gogama is a community of approximately 800 residents located in the unorganized Townships of Noble and Jack. The townsite is 75 miles southwest of Timmins on Highway #560 - three miles east of Highway #144.



2) Industry

There is no industry as such in Gogama. The residents are largely employed by three government agencies: the Ministry of Natural Resources; the Ministry of Transportation and Communications and; the Canadian National Railroad. The expanding tourist trade, made possible by the completion of the Timmins - Sudbury Highway #144 has become a fourth major employer. The community now has two hunting and fishing lodges, two motels and one hotel. The remainder of the working populace finds employment in private enterprises such as stores and restaurants or in teaching.

3) Government

Gogama is an unorganized community and as such, has no local government. The needs of the community are attended to by the Provincial government. Thus the residents pay no municipal taxes and receive few services. Law enforcement is carried out by the Ontario Provincial Police which has an office in Gogama. Fire protection is the responsibility of the Ministry of Natural Resources. Municipal water and sewage systems do not exist.

4) Topography

Gogama is located on the northern shore of Lake Minisinakwa and is surrounded by dense overgreen forest. Its location is such that the lake serves as the south and east boundary of the town.

Gogama is built upon a largely sand plain and, despite the dense bush around it, has very little vegetation. No rock outcroppings are visible at the townsite although large rock outcroppings are visible across the lake. The land slopes gently toward Lake Minisinakwa and is relatively flat.

SURVEY TECHNIQUE

1) General

The Gogama pollution survey was conducted by three staff members of the Ministry of the Environment office in Timmins during the week of June 9th through 13th, 1975.

The survey team conducted door to door interviews with all community residents to ascertain the method of sewage disposal employed by each family and the source of their drinking water supply. Water samples were acquired at each residence for bacteriological and routine chemical analysis.

The survey was conducted during the daytime between 9:00 and 5:00. As many members of the community were working, it was necessary to revisit many of the homes at night. All residences from which water samples were not obtained on the first visit were carefully noted and revisited at a later hour. If on the second visit, the survey team was unable to acquire the necessary information no further attempt was made to contact the residents.

Members of the Ministry of Natural Resources staff in Gogama were extremely helpful to the survey team throughout their stay. Staff members willingly answered any questions which arose concerning Gogama and the various water supplies, as well as provided storage space for water samples and supplied maps of the Gogama townsite. Every residence was plotted on the maps provided by the MNR as the survey progressed. This was done in order that an accurate mapping of the buildings and thus the town could be made. This map has been appended.

2) Care of Samples

All of the bacteriological and chemical samples were put in an ice-filled styrofoam cooler immediately after sampling. The bacteriological samples were then transferred to a refrigerator until they were sent to the Ministry of Health Laboratories in Timmins. Routine chemical samples were stored in a freezer at the MNR building, where they remained frozen until being packed for shipping to Toronto.

As Gogama is relatively isolated the samples could only be taken to Timmins on alternate days. Bacteriological samples were delivered to the Ministry of Health Laboratories on the Monday, Wednesday and Friday of the survey week.

Chemical samples were transported by car to Timmins where they were shipped by train to the Ministry of the Environment Laboratories in Toronto. As no freezer cars are available on these trains the samples were allowed to thaw before reaching Toronto.

3) Survey Notes:

The residents of Gogama were, in general, very willing to answer most of the questions asked by the survey team. Some people were unable to provide the information needed as they did not know the source of their water or their method of sewage disposal.

Some of the citizens, particularly the newer residents, appeared to be unaware that any water problem might exist, while others expressed little concern. Those who did express little interest seemed to the survey team to be relatively uninformed of the situation.

Other citizens were highly concerned with the quality of their water, even to the point of being verbally hostile. Many felt that no action would be taken no matter what results were obtained. Of the concerned citizens, many complained that their children were sick more than normal which necessitated finding an alternative source of supply. This means carrying water, with a great deal of inconvenience.

In total 139 homes or business were surveyed. Of these 9 homes were vacant and another 15 had no one home at the time of the survey. All of the residences surveyed have been listed in Appendix "A" in alphabetical order. Beside each name are the results obtained from chemical, bacteriological and phenol analyses.

Appendix "B" lists those residences with:

(I) bacteriological contamination,
(II) nitrate contamination,
(III) phenol contamination,
(IV) excessive chloride and sodium levels.

All residents with bacteriologically contaminated supplies were notified immediately when the Ministry received the sample results. One resident, Mrs. A Constant at 158 Cecile St., was advised at the time of the survey against using her own water supply for her two small children. This was later confirmed by mail. Mrs. Constant lives in an area known to have high nitrate levels.

SIGNIFICANCE OF RESULTS

All of the bacteriological tests were performed at the Ministry of Health Laboratory in Timmins. The routine chemical and phenol analyses were performed at the Ministry of the Environment Laboratories in Toronto.

(1) Bacteriological

The bacteriological examination is performed to determine the presence of total and faecal coliform organisms and thus the possible presence of bacteria or micro-organisms which cause disease. Three groups of mircro-organisms are generally used as indicators of faecal contamination, two of which are identified by the bacteriological examination performed by the Health Laboratory:

total coliform, and faecal coliform

Total coliform organisms include bacteria originating in the intestines of man and other warm blooded animals, as well as those bacteria which are the normal inhabitants of soil and vegetation. The presence of total coliform may indicate many sources of natural and human pollution among them: soil runoff or faecal pollution.

Faecal coliform organisms are those bacteria of purely intestinal origin, both animal and human. They are unable to survive outside of the warm body for any great length of time; hence, the presence of large numbers of faecal coliform (up to 10,000,000 per 100 mls of sample) indicates recent pollution from a nearby source. Smaller numbers of faecal coliform may indicate nearby pollution with counts reduced by dilution.

The bacteriological examination performed by the Ministry of Health yields a count of the total and faecal coliform present at the time of examination. The count is undertaken to a maximum of 80,000 total and 8,000 faecal per 100 mls for surface waters, and to 80 for both total and faecal coliform in drinking water. Coliform in excess of these figures are indicated by a plus sign (i.e. 80^{+}).

In drinking water supplies total and faecal coliform must be absent. Coliform counts above 0,0 are not acceptable in drinking water supplies as such counts indicate that micro-organisms carrying disease may be present. Water with other than a 0,0 count must be boiled for no less than fifteen minutes before it is bacteriologically safe for drinking.

For body contact recreation the geometric mean density of the coliform level should not exceed 1000/100 mls and 100/100 mls for total and faecal coliform in a series of at least ten samples per month.

(2) Phenols

This analysis measures the concentration of phenols as well as some phenolic compounds in a sample. Phenols are generally associated with petroleum products and are prevalent in industrial wastes.

Concentrations in excess of 1 ppb may cause taste and odour problems in drinking water or the tainting of fish flesh in surface waters.

(3) Routine Chemical Analysis

(I) Chloride

Chlorides are a major anion of domestic wastes and natural waters. They may also be of natural mineral origin or originate from salt spread on urban roads. In Gogama the most likely source of chlorides is domestic and animal wastes.

Generally, chlorides are not harmful to human health, although they may be injurious to some people suffering from diseases of the heart or kidneys.

The most common problem associated with high concentrations of chlorides is the imparting of a salty taste in drinking water supplies. The chloride method actually measures the total chloride, bromide, iodide and cyanide concentration. In natural fresh waters the concentrations of bromide, iodide and cyanide are negligeable; therefore, the results of chloride tests will closely resemble the chloride concentration.

The desirable level for chlorides in surface waters and drinking supplies is less than the permissible level of 250 mg/l. A salty taste may be present at concentrations greater than 250 mg/l as Cl.

II) Sodium:

Sodium is an essential element to all life forms and occurs naturally. Sodium compounds constitute some 2.83% of the earth's crust and is highly soluble. It is therefore, common in water.

Sodium is generally considered to be non-toxic. Individuals with high blood pressure, however, are usually warned to avoid the consumption of water with a concentration greater than 50 mg/l.

III) Free Ammonia

Ammonia nitrogen (free ammonia) is commonly encountered in domestic waste water and industrial effluents. It is also found as a biochemical reduction product in ground water.

Ammonia nitrogen is toxic to fish, exerts a high oxygen demand when converted to nitrite and nitrate, and interferes with water treatment procedures by reacting with chlorine to form chloramines. The latter reaction greatly reduces the effectiveness of the chlorination process. The nutritive properties of ammonia nitrogen will also promote the excessive growth of algae and other aquatic plants. Ammonia is rarely found in concentrations high enough to be harmful to humans. The permissible level for surface water supplies is 0.5 ppm (as N) and the desirable level is less than 0.01 ppm. Ammonia is unstable and is rapidly converted to other nitrogen compounds by bacterial activity. It also has a rather short life in surface waters; therefore it may not reveal the complete extent of pollution.

IV) Total Kjeldahl Nitrogen

The total kjeldahl nitrogen determination measures the total nitrogenous matter present in a given sample excepting nitrate and nitrite which are analysed separately. Total kjeldahl indicates the presence of organic nitrogen such as proteins, amines and urea as well as nitrogen present in the form of free ammonia. The total kjeldahl nitrogen less the free ammonia measures the organic nitrogen present.

Organic nitrogen is utilized in the biochemical breakdown of organic waste such as sewage. In the process of waste stabilization nitrogen components are successively oxidized from organic nitrogen, to ammonia, to nitrite and nitrate. The relative abundance of each of these compounds indicates the progression of waste stabilization.

The criteria for total kjeldahl nitrogen is in the range of 1 to 3 parts per million (ppm). Readings of over 5 are a definite indication that domestic sewage is present.

V) Nitrite Nitrogen

Nitrite is present in natural waters as an intermediary stage in the decomposition of organic nitrogen. Organic nitrogen is oxidized by autotrophic bacteria to ammonia, then to nitrite and finally nitrate. As nitrite exists in this process only as an intermediary, it is highly unstable and its presence is short lived; for this reason actual nitrite concentrations are difficult to determine. Nitrite levels exceeding 0.02 ppm indicate that bacterial action is taking place.

VI) Nitrate Nitrogen

Nitrate is the end product of the decomposition of organic nitrogen (as mentioned above). The relative concentration of nitrate signifies the extent to which organic nitrogenous matter has been broken down. Although generally considered non-toxic to adults, high nitrate levels in drinking water contribute to infant methemoglobinemia, a disease which inhibits the oxygen carrying capacity of the blood. Water containing an excessive quantity of nitrate should not be consumed by pregnant women or small children. High nitrate levels in surface waters lead to over-abundant algae and aquatic plant growth.

The maximum permissible level of nitrate in domestic water supplies in Ontario is 10 ppm. Nitrate concentrations over 10.0 ppm are excessive.

VII Conductivity

The conductivity of water is used to determine the amount of dissolved solids present. Most inorganic substances are good conductors while organic compounds undergo minimal ionization in aqueous solutions and are therefore, poor conductors. By multiplying the conductivity of the sample by 0.65±0.10 (this figure being determined by the amount of natural dissolved solids and conductivity of most Ontario lakes) it is possible to determine the concentrations of dissolved solids in the water sample. The permissible level for dissolved solids is 500 ppm which corresponds to a conductivity of approximately 770 μmhos/cm. The desirable level for dissolved solids is less than 200 ppm.

A high conductivity result suggests a high level of dissolved inorganic solids present. From this we can assume that wastes other than sewage are gaining access to the body of water.

SURVEY RESULTS

1) Sewage Disposal

Gogama has no municipal sewer system. Therefore sewage disposal is effected on an individual basis. Not all of the community's residents were aware of what method of sewage system they employed. From the 108 individuals who were interviewed, it was ascertained that 7 homes used outhouses and directed waste wash water to open ditches or cesspools; 37 had septic tanks and 64 had cesspools.

Cesspools are open bottomed and are usually buried to a depth of 10-12 feet. As Gogama has a high water table, this places the cesspools close to or in the ground water table. As the sewage wastes decompose, organic nitrogen is oxidized to nitrate. Since nitrate is the last phase of the nitrogen cycle, it remains in the ground and contaminates the ground water. It is believed that due to the gentle slope of the land and the small hydraulic gradient across the community that the nitrates created by this organic decomposition reach the ground water and are moving through the soil towards the lake.

The Ministry of Natural Resources operates the only community sewage treatment system. This system serves the buildings located on Provincial government land only. The sewage treatment plant is located on the north side of the tracks near Lake Minisinakwa. The effluent from this secondary treatment plant is discharged into the lake.

2) Water Supply

The residents of Gogama obtain their water from one of three sources, the Ministry of Natural Resources (MNR) supply, the Canadian National Railway (CNR) supply, or private supplies.

(I) Ministry of Natural Resources

The Ministry of Natural Resources operates a community water system which supplies the residents living on MNR property. The system is also used as a potable water supply by residents who are unable to drink the water obtained from their own private wells due to contamination of one kind or another. At the time of the survey the water line from MNR system to a point across the tracks was under construction by a contractor engaged by the Ministry of the Environment. This facility will simplify the task of obtaining safe water by those with individual supplies.

The MNR system uses Lake Minisinakwa as its source, the water is treated and chlorinated before distribution. The system appears to be adequately meeting the present demands for water. Bacteriological examination of water samples from the Ministry buildings revealed no coliform contamination. The bacteriological examination of water taken from the low lift well at the water treatment plant was 6, and 0 while the analysis at the low lift itself indicated the presence of faecal coliform (2, and 2). These are relatively low results and were obtained from water with preliminary chlorination only. High lift results indicated that the water was acceptable for drinking. A detailed report on the MNR water system is being prepared by the Environmental Officer responsible for this area.

(II) Canadian National Railway Water Works

Some 26 residences and businesses obtain drinking water from the CNR water supply. Included in this number is the separate school and a motel.

The system was installed in 1962 after an accidental spill from a tank car carrying methyl isobutal ketone. The chemical seeped into the ground and contaminated wells in the immediate vicinity.

As the chemical slowly moved through the ground, additional wells became contaminated.

The CNR accepted responsibility for the contamination and agreed to provide an alternative water supply to the affected residents. The alternative source was provided by expanding the CNR station water works. There has been no evidence of any recent spreading of this contaminant.

Water is taken from Lake Minisinakwa, chlorinated and then distributed to the residents. During the survey the CN water supply was cut off for a while every day, twice on one day. According to Mrs. C. N. Constantine whose husband looks after the system, on four of those days the breakers at the pump were responsible for the shut-down. When the pump is over-worked the breakers shut the system down. The continual failure of this sytem would seem to indicate that it is over-extended. The shut-down on June 11th was due to Ontario Hydro turning off the electricity. The pumps are electric and have no alternative source of power. The survey team received many complaints concerning the CN water system. The most frequent complaints concerned poor colour, taste and odour. Other complaints concerned frequent chlorinator malfunction.

Although there were complaints registered and there was evidence of the inability of the system to supply water during periods of heavy demand, no excessive contamination of any kind was found during the survey. Bacteriological analysis indicated that the water was safe for drinking throughout the system. As would be expected of the water from the lake, the nitrate levels did not exceed 0.2 ppm, sodium chlorides and conductivity were lower than those in the ground water and free ammonia and nitrite were below the detectable levels.

In terms of the bacteriological and chemical quality, the water of the CNR was safe to drink although it may be aesthetically displeasing to some.

III) Private Well Supplies

Gogama residents with private water supplies have:

1) Sand Points or
2) Drilled Wells

Sand points are utilized most frequently because the high water table in Gogama makes it relatively easy and inexpensive to obtain water by this method. Drilled wells have only come into popular use recently, apparently in an attempt to avoid nitrate contamination.

1) Sand Points

Over half of the residents of Gogama rely on sand points for their drinking water supply. A small number of those with sand points use the water for washing purposes only and carry drinking water from the MNR supply or from neighbour's drilled wells. This however, is true of only a small percentage of the total users of sand points.

Sixty-four of the dwellings surveyed relied on sand points, and a large number of these supplies are contaminated by nitrates. Thirty of the supplies tested had nitrate levels exceeding 1.0 ppm. Eighteen (18) supplies had nitrate levels greater than 10.0 ppm. In total 47 (or 73%) of those sand points tested had elevated nitrate levels.

Nitrates were not the only contaminants found in private water supplies. Other contaminants found in water samples from sand points included:

1) chlorides - levels above 250 mg/l were noted in six samples (9.3%),

2) sodium - excessive levels were recorded in 21 of the samples (33%),

3) free ammonia - indicative of decomposing organic matter, was present in quantities greater than the permissible level in 19 of the sand point samples,

4) total kjeldahl nitrogen readings were above 5.0 ppm in two of the samples; another 6 had readings greater than 2.5 ppm.

Phenolic, bacteriological and chemical contamination was found in two supplies on West St.. Both residents obtain drinking water from their own sand points. These residents were contacted by this Ministry and advised not to use their water for drinking.

II) Well Supplies

Some 16 residents have had wells (ranging from 35 to 69 feet in depth) drilled since 1974, only 10 of which were sampled during the survey. It was hoped that drilled wells would prove to be a solution to the nitrate problem but unfortunately these supplies were not free of contamination. One of the wells (L. Marceau) was bacteriologically contaminated, another four had excessive nitrate levels, and two had high sodium levels. Two other residences believed to have wells which were drilled before 1974, also had water supplied with contamination.

It would appear from the results that water obtained from wells in the Gogama area is no less contaminated than sand points.

3) Contaminated Areas

Nitrate contamination is widespread in Gogama; however, there is no specific area of contamination. Clusters of contaminated wells can be noted throughout the townsite. Most of the high nitrate levels were recorded on the south side of town (the area where most of the population is located). It would appear

that the nitrates are moving radially out from the centre of the town following the hydraulic gradient towards the lake. If this is the case, then nitrate contamination can be expected to increase rather than decrease as new nitrate rich waste waters continue to move down into the ground water table from cesspools and septic tanks of the community as water usage increases. This theory is reinforced by the fact that nitrate contamination has increased in terms of the total number of wells recording levels greater than 10.0 ppm since 1973.

The results from the water supplies on Beatrice Street demonstrate the movement of nitrates. In 1973, four dwellings (lots 125 through 128) recorded levels of nitrate greater than 10 ppm. In 1975, only lot 128 was found to have such high levels on the west side of the street; but on the east side nitrate levels were in excess of 10.0 ppm. In addition, other areas previously free of contamination, such as the 3 blocks bordered by West, James and Miller Streets, are now contaminated.

Considering the increase in the number of supplies contaminated by nitrates in the last two years, the movement of the nitrate towards the periphery of the town, and the continued use of cesspools and septic tanks, it would appear that extent of present contamination will remain much as it is, varying only in degree over the years as the nitrates move.

Phenol

Phenolic contamination has decreased since 1973. All of the areas contaminated by petroleum spills in the early seventies were tested again during the survey and none showed any contamination. This may be due partly to the installation of charcoal filters by the responsible companies and the elimination of the sources of the petroleum products.

Phenol contamination was found in two supplies on West St. but could be attributed to no specific source.

Bacteriological

Bacteriological contamination could not be localized. Only ten of the samples were adverse bacteriologically. Of these, three may be due to contamination during the sampling. All of these residents were notified that their water should be boiled before using.

One of the contaminated samples was taken from the supply to the cabins at the Gogama Lodge. In this case, water from the lake is being used without chlorination. The owner was advised to chlorinate this supply.

One resident, Mr. W. Brouillard of 45 West St., was using a supply which had coliform levels above the count (80+) limit. It is possible that cesspools may be located too close to his sand point.

As with the adverse phenol samples the adverse bacteriological samples were obtained from different supplies than those recorded in 1975.

IV) Sodium Contamination

Excessive sodium levels were recorded in 23 of the private supplies. The levels recorded were as high as 213 ppm. High sodium levels were recorded in various supplies in different areas of town; the high sodium levels were not localized.

Again the high sodium levels in 1975 exceed those recorded in 1973. The highest level at that time was 109 ppm and only 13 of the 35 supplies tested had excessive levels.

CONCLUSIONS

The communal water supplies in Gogama were supplying water that was safe to drink. Bacteriological examinations indicated that both the MNR and CNR supplies were free of coliform organisms. Chemical results of samples taken from the CNR supply had nitrate and sodium levels below problem levels. The CNR however, supplies water which is aesthetically displeasing in terms of colour and odour and the system appears to be unable to supply the system demands.

Many private supplies are contaminated by nitrates in quantities as high as 25 ppm. Contamination has increased as many areas free of nitrate two years ago now have levels exceeding the permissible level. The contamination is moving down the hydraulic gradient following the slope of the land away from the centre of the community to the lake. With the continued use of cesspools and septic tanks in Gogama, and the trend toward increasing water consumption, it seems evident that nitrate levels will continue to be high in the areas presently suffering from high levels and that other areas will become contaminated as the water moves slowly to the lake.

RECOMMENDATIONS

(1) In Gogama, water from ground water supplies should not be used by pregnant women or infants.

(2) A communal water supply system utilizing a source that is free from contamination should be developed for the community. (There are no interim measures that can be taken to correct the existing problems on an individual basis).

JH/ll

Prepared by: _____
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Approved by: _____
G. W. Scott P. Eng.,
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APPENDIX "A"

INDIVIDUAL RESIDENTS SAMPLES RESULTS

SURVEY PERIOD - JUNE 9 - 13, 1975

RESIDENTS NAME & ADDRESS	COLIFORMS TOTAL (per 100 mls)	FAECAL (per 100 mls)	PHENOL (ppb)	Cl- mg/l	SODIUM mg/l as Na	FREE AMMONIA mg/l as N	TOTAL KJELDHAL mg/l as N	NITRITE mg/l as N	NITRATE mg/l as N	CONDUCTIVITY
J. Armond, 16 Harris St.	0	0		31	18	.1	.5	<.02	1.8	360
B. Babb, 207 & 208 Poupore St. (pt)	0	0		28	25	<.1	.5	<.02	<.2	440
Oscar Baulne, 82 Henry St. (pt) 37	0	0	3	165	127	1.6	2.5	.02	<.2	800
Rheo Beauchamp Poupore St. (w)	0	0		24	10	.2	.6	<.02	.4	325
C. Beland, 59 West St. (pt) 39	0	0		22	8	<.1	.5	<.02	5.5	315
O. Blanchette, 41 Hazel (w) 32	0	0		26	14	<.1	.6	<.02	<.2	450
H. Belanger, Pine St. (pt) 21	0	0		365	197	2.5	3.1	.08	<.2	1450
W. Brouillard, 45 West St. (pt) 36	80+	80+	1	175	84	1.0	2.0	.06	1.9	720
E.J. Brown, 157 Cecile St. (pt) 109	0	0		12	13	<.1	.3	<.02	9.7	460
L. Bruneau, 107 Miller St. (pt) 79	0	0		409	194	<.1	.3	<.02	2.7	1600
R. Bruneau, 33 McGowan St. (pt) 163	0	0		135	87	<.1	.3	<.02	1.0	600
R. Brunelle, 84 Pine St. (CN) 64	0	0		9	4	<.1	.5	<.02	<.2	83
R. Brunette, 7 Poupore St. (pt) 2	2	2								
E. Bureau, 111 Miller St. (pt) 71	0	0		57	25	<.1	.4	<.02	<.02	760
R. Carriere, 27 Poupore St. (CN) 90	0	0		8	4	<.1	.7	<.02	<.02	87
Charbonneau, 180 & 181 Harris St. (pt) 104	0	0		37	18	<.1	.3	<.02	8.2	570
M. Charbonneau, 180 & 181 Pine St. 22	0	0		4	2	<.1	.3	.02	3.1	190
M. Charbonneau, 96 & 97 Miller St. (w)	0	0		27	22	<.1	.5	<.02	17	500
R. Chartier, 64 Arthur St. (pt) 49	0	0		63	31	<.1	.4	.18	15	580
W. Chartier, 132 John St. (pt) 147	0	0		4	2	<.1	.3	.02	3.1	190

RESIDENTS NAME & ADDRESS	COLIFORMS TOTAL-(Per 100 mls)	FAECAL (per 100 mls)	PHENOLS (ppb)	Cl mg/l	SODIUM mg/l as Na	FREE AMMONIA mg/l as N	TOTAL KJELDHAL mg/l as N	NITRITE mg/l as N	NITRATE mg/l as N	CONDUCTIVITY
S. Chenard, 133 Beatrice St. (pt) 99	0	0		25	19	<.1	.2	<.02	20	500
E. Clifford, 145 Spruce St. (pt) 106	0	0		30	24	<.1	.4	<.02	17.	630
L. Chenier, 49 Poupore St. (w) 23	0	0		85	56	<.1	.4	<.02	<.02	800
J. Cloutier, 89 Henry St. (w) 53	0	0		22	17	<.1	.7	.04	7.1	420
E. Collins, 207 Poupore St. 5	0	0								
O. Collin, 48 Pine St. (w) 30	0	0		41	36	.4	.8	<.02	1.0	260
M. Constance, 47 West St. (w) 42	0	0		31	8	<.1	.3	<.02	<.2	420
A. Constant, 81 Henry St. (pt) 52	0	0		8	3	<.1	.5	<.02	1.6	235
A. Constant, 158 Cecile St. (pt) 110	0	0		12	3	<.1	.2	<.02	6.5	285
L. Constantin, Miller St. (w)										
Constantine, Poupore St. (CN) 91	0	0	<1	8	4	<.1	.5	<.02	<.2	84
L. Couture, 33 McGowan St. (pt) 164	0	0		203	92	<.1	.3	<.02	1.7	810
M. Damour, 67 Arthur St. (pt) 46	0	0		50	41	2.9	3.1	.04	7.4	430
R. Dodd,	0	0								
R. Duguay, 106 Miller St. (w) 80	0	0		109	86	.1	.7	<.02	5.2	1090
G. Edmond, 3 Poupore St. (w) 6	0	0		24	8	<.1	.4	<.02	<.2	215
J.A. Ewing, 37 Hazel St. (pt)				105	88	.8	1.1	<.02	<.2	520
G. Gaouette, 174 Poupore St. (w) 116	0	0		7	5	<.1	.6	.02	<.2	84
O. Gervais, 87 & 88 Henry (pt) 55	0	0		27	16	<.1	.5	<.02	15.	470
R. Gaudette, 174 Poupore St. (w) 118	0	0		58	43	<.1	.4	.02	2.1	700

RESIDENTS NAME & ADDRESS	COLIFORMS TOTAL (per 100 mls)	FAECAL (per 100 mls)	PHENOLS (ppb)	Cl - mg/l	SODIUM mg/l as Na	FREE AMMONIA mg/l as N	TOTAL KJELDHAL mg/l as N	NITRITE mg/l as N	NITRATE mg/l as N	CONDUCTIVITY
Y Gervais, 71 Arthur St. (pt) 47	0	0		50	26	<.1	.6	<.02	5.4	415
R. Gignac, 172 Pine St. (CN) 66	0	0	<1	8	4	<.1	.6	<.02	<.2	82
B. Gignac, 100 John St. (pt) 40	0	0	<1	20	16	.7	1.1	<.02	25	420
L. Godon, 42 & 43 Poupore St. (pt) 121	0	0	<1	261	127	1.5	1.6	<.02	11	1090
P. Goudreau, ½ 41 Hazel St. (pt) 31	0	0		62	64	1.4	1.5	.02	13	440
D. Gravelle, 48 Poupore St. (pt) 124	0	0	<1	171	111	.2	.6	<.02	6.5	770
R. E. Gravelle, 41 Poupore St. (pt) 88	0	0	<1	135	88	.4	.8	.18	<.2	570
R. Groulx, 128 Beatrice St. (pt) 98	80+	6		159	129	3.4	3.6	.12	17	1260
V. Groulx, 177 Pine St. (pt) 19	0	0		5	119	16	3.0	<.02	<.2	1000
O. Huard, Birch St. (w) 152	0	0		4	5	<.1	.6	<.02	<.2	83
R. Jacques, 165 James St. (CN) 61	0	0		8	4	<.1	.3	<.02	<.2	82
B. Ladaroutte, 84 Henry St. (pt) 78	0	0		33	24	<.1	.7	<.02	4.7	470
E. Lapierre, 108 & 109 Miller St. (pt)	0	0		225	97	3.5	3.6	<.02	6.3	1020
E. Larante, 35 Pine St. (w) 28	0	0		15	6	<.1	.4	.02	<.2	395
V. Laroux, 68 Poupore St. (pt) 115	0	0		5	4	<.1	.3	<.02	25	260
E. Lavoie, 209 Poupore St. (pt) 3	0	0		20	9	<.1	.4	<.02	.8	170
J. Laurette, 44 West St. (pt) 35	34	2		57	47	3.2	11	<.02	19	495
G. Lavoie, 86 Pine St. (pt)	0	0	<	267	95	<.1	.4	<.02	<.2	1110
A. Label, 56 Arthur St. (CN) 14	0	0		7	4	.1	.6	<.02	<.2	80

RESIDENTS NAME & ADDRESS	COLIFORMS TOTAL (per 100 mls	FAECAL (per 100 mls	PHENOLS (ppb)	Cl (mg/l)	SODIUM mg/l as Na	FREE AMMONIA mg/a as N	TOTAL KJELDHAL mg/l as N	NITRITE mg/l as N	NITRATE mg/l as N	CONDUCTIVITY
A. Montha, 32 Hazel St. (pt) 27	0	0		351	213	<.1	.4	<.02	.6	1230
L. Marceau, 99 McGowan St. (w) 145	10	0		26	15	<.1	.4	<.02	<.2	640
M. Mathieu, 58 James St. (CN) 58	0	0		9	6	<.1	.8	<.02	<.2	90
A.E. Mathieu, 5 Poupore St. (pt) 9	0	0		18	7	<.1	.4	<.02	<.2	185
Lionel Mathieu, 200 Harris St. (pt) 7	0	0		55	41	5.2	5.5	<.02	9.4	450
*V. Mathieu, 17 Beatrice St. (pt) 102	0	0		30	31	<.1	.3	.44	18.0	680
M. Melancon, 64 Pine St. (CN) 70	0	0		5	4	<.1	.5	<.02	.2	83
V. Monahan, 65 Arthur St. (pt) 41	0	0		67	58	.2	.6	.04	2.5	720
*G. Mulhern, 129 Beatrice St. (pt) 103	0	0		64	27	<.1	.5	<.02	4.8	680
A. Nadeau, 74 Arthur St. (pt) 44	0	0		50	53	.1	.7	<.02	6.6	365
L. Nadeau, 7 & 8 Poupore (pt) 10	0	0		37	14	<.1	.3	<.02	9.8	305
G. Pare, Harris St. (CN) 16	0	0		7	5	<.1	.7	<.02	.2	82
M. Naveau, 122 James St. (pt) 73	0	0		7	4	<.1	.4	<.02	7.3	235
*E. Perrault, 35 Hazel St. (pt) 26	0	0		9	5	<.1	.8	<.02	<.2	175
E. Perrault, 178 Pine St. (pt) 20				262	98	2.7	2.8	<.02	<.2	960
E. Perrault, 75 Arthur St. (w) 50	2	0		18	17	.2	.8	.02	13	310
E. Pilon, 63 Pine St. (CN) 15	0	0		7	4	<.1	.6	<.02	<.2	80
*D. Porter, 101 John St. (pt) 141	0	0	1	26	39	3.4	3.6	.30	20	495
L. Quinn, Canfield (pt) 168	0	0		8	6	<.1	.4	<.02	2.4	190

RESIDENTS NAME & ADDRESS	COLIFORMS TOTAL (per 100 mls)	FAECAL- (per 100 mls	PHENOLS -(ppb Cl - mg/l	SODIUM mg/l as Na	FREE AMMONIA mg/l as N	TOTAL KJELDAHL mg/l as N	NITRITE mg/l as N	NITRATE mg/l as N	CONDUCTIVITY
L. Radke, 43 Canfield St. (pt) 166	0	0	9	5	<.1	.7	<.02	1.6	154
A. Rice, 104 Miller St. (pt) 76	0	0	15	15	.6	1.0	<.02	17	260
E.J. Rochon, 46 Poupore St. (pt) 120	0	0	220	93	.1	.4	.02	9.5	990
A. Savard, 52 West (pt) 34	0	0	34	25	2.0	2.4	.02	10.0	275
R. Savard, ½ 51 James St. (pt) 48	0	0	105	59	.6	.9	.54	2.9	470
M. Scanlan, 131 Beatrice St. (pt) 101	0	0	55	9	<.1	.3	<.02	14.0	730
C. Secord, ½ James St. (pt) 43	0	0	46	35	.6	.8	<.02	8.2	310
*G. Secord, 121 Beatrice St. (pt) 73B	0	0	5	3	<.1	.2	<.02	5.3	165
L. Secord, 55 & 56 Harris St. (CN) 13	0	0	7	4	<.1	.6	<.02	<.2	77
G. Simoneau, 36 Harris St. (CN) 27	0	0	7	4	<.1	.4	<.02	.2	92
P. Simoneau, 83 Pine St. (CN) 65	0	0	5	4	<.1	.5	<.02	<.2	83
J. Stevenson, Poupore St. (CN) 92	0	0	8	4	<.1	.6	<.02	<.2	85
M. Smith (CN)									
G. Talbot, 61 Harris St. (CN) 134	0	0	7	4	<.1	.4	<.02	<.2	90
G. Talbot, 29 Henry St. (CN) 132	0	0	6	4	<.1	.5	<.02	<.2	83
A. Tassey, 168 Poupore St. (pt) 114	0	0	16	9	<.1	.3	<.02	.6	245
D. Thibeault, 53 James St. (pt) 40	0	0	37	36	.6	1.2	<.02	1.4	310
D. Thibeault, 45 Harris St. (w) 8	0	0	22	12	.1	.5	<.02	<.2	580
E. Turgeon, 51 Miller St. (pt) 82	0	0	195	122	1.2	1.6	.04	<.2	800
*R. Veronneau, 68 Arthur St. (pt) 45	0	0	178	83	3.2	3.4	<.02	3.2	760
R. Veronneau, 85 Henry St. (pt) 56	0	0	63	33	1.8	2.2	.28	10	610
W. Wright, 48 McGowan St. (pt) 158	0	0	33	25	<.1	.3	<.02	1.0	510

BUSINESS, NAME & ADDRESS	COLIFORMS TOTAL (per 100 mls)	FAECAL (per 100 mls)	PHENOLS - (ppb C1 - mg/l	SODIUM mg/l as Na	FREE AMMONIA mg/l as N	TOTAL KJELDHAL mg/l as N	NITRITE mg/l as N	NITRATE mg/l as N	CONDUCTIVITY
Manderly Manner Motel Miller St. (w) Lake Water	56	0							
Minisinakwa Lodge	0	0	.2	2	<.1	.5	<.02	<.2	69
B. Turcotte 70 (lake) (well) Lake Water	80	40	1	1	.1	.1	<.02	.2	60
Nadeau's Restaurant, 68 & 69 Henry St. (CN) 68	0	0	6	5	<.1	.5	<.02	<.2	86
C.D. Payette & Sons Store 138 Poupore St. (CN)	0	0	8	5	<.1	.6	<.02	<.2	85
C.N.R. Station (CN) 93	0	0	7	4	<.1	.5	<.02	<.2	81
Simoneau's Confectionary 32 Poupore St. (pt) 87	0	0	93	44	.2	.5	<.02	1.8	410
Sisters of Holy Cross Church Poupore St. (w)	0	0	56	36	<.1	.5	<.02	2.4	690
St. Rosaire School	0	0	17	6	.1	.4	<.02	<.2	120
Stardust Motel, 17,18&19 Poupore St. (CN)	0	0	8	4	<.1	.6	<.02	<.2	81
J. Alexander, 47 Poupore St. 125 Gogama Hotel (pt)	0	0	<1 141	102	.1	.4	<.02	.8	690
J.W. Charbonneau, Poupore St. 88 Gogama Pool Room	0	0	151	62	<.1	.4	<.02	1.4	600
*M. Constant (pt) 86 Texaco Garage	0	0	<1 72	49	.6	1.1	<.02	.2	410
L. Godon, 42 & 43 Poupore (Rest.) Gogama Public School lots	0	0	261	127	1.5	1.6	<.02	11	1090
Gagama OPP Station (MNR)	0	0							
R. Harlock - Gogama Lodge sand (pt)	0	0	29	26	<.1	.4	<.02	18	465
Cabin #1 water supply	28	8							
Lake Water	80	40	1	1	<.1	.5	<.02	<.2	83
Hudson Bay Store Poupore St. (CN)	0	0	10	6	<.1	.5	<.02	<.2	92
Ideal Hardware 21 Poupore	0	0	8	5	<.1	.6	<.02	<.2	85
G. Lavoie, 87 Pine St.	0	0	<1 87	61	<.1	.8	<.02	8.0	495
Manderly Manner Motel (Krasuski water supply well	0	0							
MNR Water Treatment Plant									
High Lift	0	0							
Low Lift	2	2							
Staff House	0	0							
Warehouse	0	0							

APPENDIX "B"

1) HIGH NITRATE LEVELS IN GROUNDWATER SUPPLIES

GOGAMA (JUNE 1975)

RESIDENTS NAME		NITRATE mg/l as N
B. Gignac, 100 John St.		25.0 ppm
S. Chenard, 133 Beatrice St.		20.0
D. Porter, 101 John St.		20.0
V. Mathieu, 17 Beatrice St.		18.0
Gogama Lodge		18.0
R. Groulx, 128 Beatrice St.	(80^{+}, 6)	17.0
A. Rice, 107 Pine St.		17.0
M. Charbonneau, 96 & 97 Miller		17.0
E. Clifford, 145 Spruce St.		17.0
R. Baulne, 82 Henry St.		16.0
R. Chartier, 64 Arthur St.		15.0
M. Scanlan, 131 Beatrice St.		14.0
P. Goudreau, ½ 41 Hazel St.		13.0
E. Perrault, 75 Arthur St.	(2,0)	13.0
L. Gordon, 42 & 43 Poupore St. (Restaurant)		11.0
A. Savard, 52 West St.		10.0
Rene Veronneau, 85 Henry St.		10.0
Lawrent Nadeau, 7 Poupore St.		9.8
E. J. Brown, 157 Cecile St.		9.7
O. Gervais, 87 & 88 Henry St.		15.0
E. J. Rochon, 46 Poupore St.		9.5 ppm
L. Mathieu, 200 Harris St.		9.4
L. Charbonneau, 179 & 180 Harris St.		8.2
C. Secord, ½ 51 James St.		8.2
*G. Lavoie, 86 Pine St. (Store)		8.0
J. Laurette, 44 West St.		7.9
M. Damour, 66 & 67 Arthur St.		7.4
J. Cloutier, 89 Henry St.		7.1
A. Nadeau, 44 Arthur St.		6.6
A. Constant, 158 Cecile St.		6.5

RESIDENTS NAME	NITRATE mg/l as N
D. Gravelle, 48 Poupore St.	6.5
E. Lapierre, 108 & 109 Miller St.	6.3
C. Beland, 59 West St.	5.5
Y. Gervais, 70 & 71 Arthur St.	5.4
G. Secord, 121 Beatrice St.	5.3
R. Duguay, 106 Miller St.	5.2
G. Mulhern, 129 Beatrice St.	4.8
W. Ladaroute, 84 Henry St.	4.7
R. Veronneau, 68 Arthur St.	3.2
W. Chartier, 132 John St.	3.1 ppm
R. Savard, ½ 51 James St.	2.9
L. Bruneau, 107 Miller St.	2.7
V. Laroux, 169 Poupore St.	2.5
L. Quinn, Canfield St.	2.4
St. Rosaire Catholic Church, Poupore St.	2.4
R. Gaudette, 172 Poupore St.	2.1
156 James St. (no english spoken)	2.0
W. Brouillard, 45 West St. (80^+, 80^+)	1.9
C. Simoneau, 32 Poupore St. (confectionary)	1.8
J. Armond, 16 Harris St.	1.8
L. Couture, 33 McGowan St.	1.7
L. Radke, 43 Canfield St.	1.6
D. Thibeault, 53 West St.	1.4
J. W. Charbonneau, 31 Poupore St. (pool room)	1.4
R. Bruneau, 33 McGowan St.	1.0
O. Collin, 48 Pine St.	1.0
W. Wright, 48 McGowan St.	1.0

APPENDIX "B"

GOGAMA GROUNDWATER SUPPLIES JUNE 1975

2) ADVERSE BACTERIOLOGICAL SAMPLE RESULTS

3) ADVERSE PHENOL SAMPLE RESULTS

RESIDENTS NAME	BACTERIOLOGICAL SAMPLES	
	TOTAL per 100/ml	FAECAL per 100 mls
W. Brouillard, 45 West St.	80^{+}	80^{+}mg/l
R. Groulx, 128 Beatrice	80^{+}	6
J. Laurette, 44 West St.	34	2
L. Marceau, 99 McGowan St.	10	0
R. Brunette, 7 Poupore St.	2	2
E. Perrault, 75 Arthur St.	2	0
A. Constant, 81 Henry St.	2	0
M.N.R. - Water Treatment Plant	2	2
- Low Lift Low lift well	6	0
Gogama Lodge - Cabin #1	20	6

	Phenol Samples
O. Baulne, 46 West St.	3 p.p.m.
W. Brouillard, 45 West St.	1 p.p.m.

APPENDIX "B"

4) ELEVATED SODIUM LEVELS

GOGAMA - GROUNDWATER SUPPLIES

(JUNE 1975)

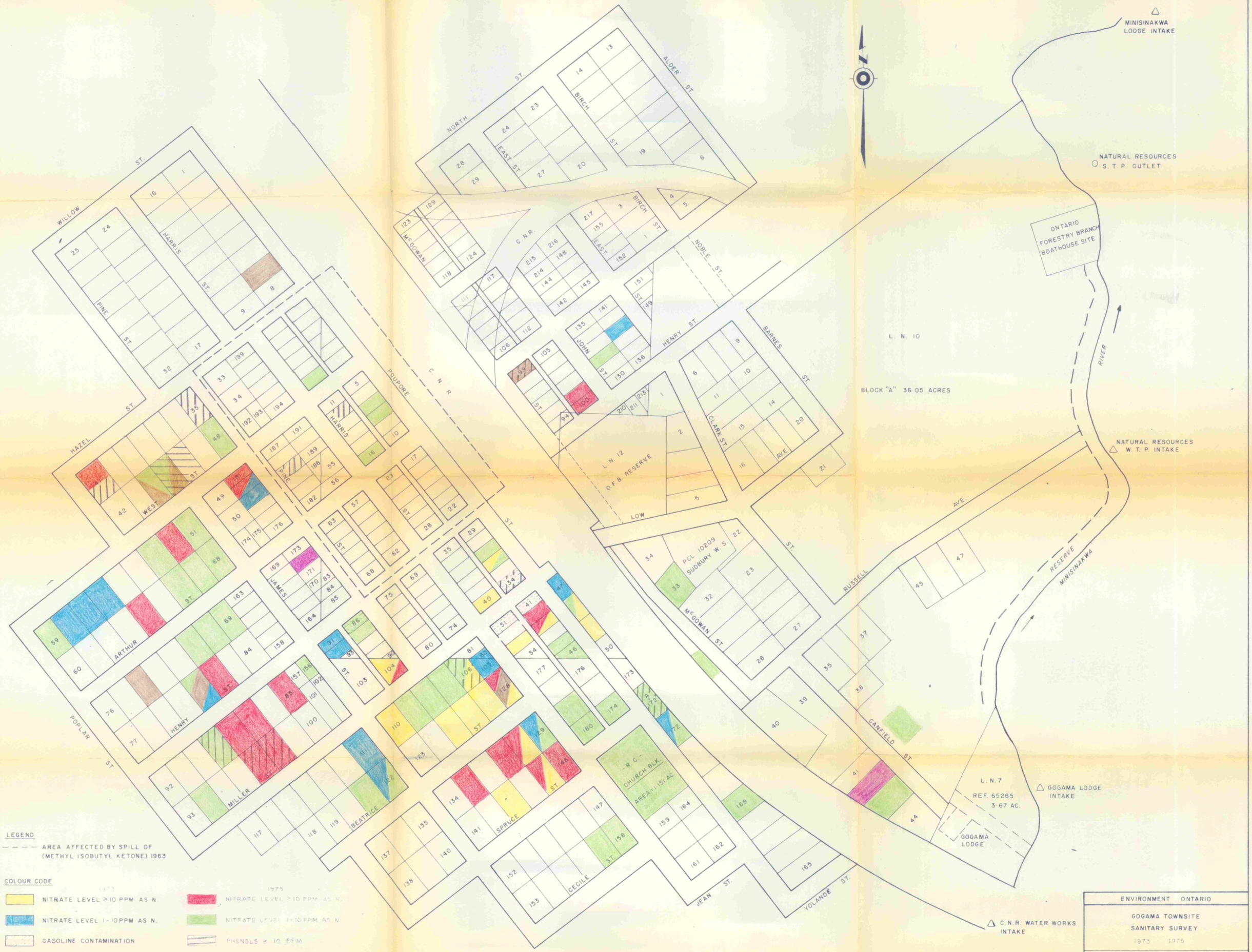
RESIDENTS NAME	SODIUM as Na in mg/l
Oscar Baulne	127 ppm
H. Belanger	197
W. Brovillard	84
L. Bruneau	194
R. Bruneau	87
L. Chenier	56
L. Couture	92
R. Duguay	86
J. A. Ewing	88
L. Godon	127
D. Gravelle	111
R. E. Gravelle	88
R. Groulx	129
V. Groulx	119
G. Lavoie	95
A. Mantha	213
A. Nadeau	53
E. Perrault	98
E. J. Rochon	93
R. Savard	59
E. Turgeon	122
R. Verroneau	83

APPENDIX "B"

5) ELEVATED CHLORIDE LEVELS

RESIDENT	CHLORIDE LEVEL As Cl mg/l
H. Belanger	365
L. Bruneau	409
L. Godon	261
L. Lavoie	267
A. Montha	351
E. Perrault	262

GOGAMA



LEGEND

- - - - AREA AFFECTED BY SPILL OF (METHYL ISOBUTYL KETONE) 1963

COLOUR CODE

1973	1975
NITRATE LEVEL > 10 PPM AS N.	NITRATE LEVEL > 10 PPM AS N.
NITRATE LEVEL 1-10 PPM AS N.	NITRATE LEVEL 1-10 PPM AS N.
GASOLINE CONTAMINATION	PHENOLS > 10 PPM
ADVERSE BACTERIOLOGICAL SAMPLES	ADVERSE BACTERIOLOGICAL SAMPLES

HOUSES SUPPLIED BY WELLS

200 100 0 200 FT.

ENVIRONMENT ONTARIO

GOGAMA TOWNSITE
SANITARY SURVEY
1973 1975

SCALE: 1" = 200'	
DRAWN BY: R.S.	DATE: SEPT. 1973
CHECKED BY:	DRAWING No: 73-57-DE